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INTER - ITEM ASSOCIATIVE STRENGTH AND IMMEDIATE FREE AND FORCED RECALL

by

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INTER - ITEM ASSOCIATIVE STRENGTH AND IMMEDIATE FREE AND FORCED RECALL

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Deese (1959) has reported that, when Ss give immediate recall for a list which they have heard once, there is a strong relationship between the inter-item associative strength of the list and the recall score ($r = .88$). Deese also showed that there is a substantial relationship ($r = -.48$) between inter-item associative strength and number of extra-list intrusions. These findings emerged from an experiment in which three groups of subjects each heard and recalled six fifteen-word lists. For each group, two of the lists were composed of high-frequency associates of Kent-Rosanoff stimulus words, two were composed of low-frequency associates of Kent-Rosanoff stimulus words, and two were composed of zero-frequency associates to Kent-Rosanoff stimulus words. The lists were matched for the L-count frequency given by Thorndike and Lorge (1944).

From this experiment and others, Deese concluded that immediate memory in this situation can be described as involving the actual recall of a few words, to which the S then associates to complete his "recall". The appropriateness of the associations to S's recall, Deese suggested, is determined by the extent to which the associations are normal responses to more than one list member, i.e., if list members "converge" on the association. If the convergence is high, the item will be "recalled" (even if it was not on the list); if the convergence is low, however, such associations will not be supported and will tend either not to be "recalled" or will result in a variety of intrusions, each given by one or, at most, a small number of Ss.

If, as Deese suggests, "recall" consists essentially in free associating to the words one does remember, the question arises as to why the S stops short of emitting enough responses to match, approximately, list length. In Deese's study, Ss recalled, on the average, only about half the words on the high-frequency lists and less than half on the low and zero-frequency lists. This failure to produce more words could be explained if the S discriminates between words which occur to him and which he is certain were on the list and words which occur to him of whose list membership he is uncertain. Perhaps S is guided by a set for accuracy and does not list the additional words of which he thinks because he is uncertain that they are correct. The present experiment was conducted in order to obtain information on this possibility.

Part of Deese's experiment was replicated but with the addition that after the period of recall S was asked to list additional words, any words he could think of if necessary, until he had produced as many words as there were on the list.

METHOD

Materials and Procedures: There were three groups of student Ss, 17 in one, 22 in another, and 23 in the third. They were registered in psychology courses. As in Deese's experiment, there were 18 lists to be learned, all taken from Deese's paper (Deese, 1959, Table 1, p.307). Each S in each group learned, successively, two high-frequency, two low-frequency, and two zero-frequency lists, there being a different set of six lists for each group. Each list was read aloud once, slowly and monotonously, and S gave his free recall immediately after list presentation. Prior to a list presentation, S was told the "name" of the list, and he was instructed to write this name on his recall sheet before the list was read. The name was actually the Kent-Rosanoff

stimulus word to which the responses in the high and low-frequency lists were associates; the same name was used for the zero-frequency list in that set.*

When all Ss had completed their free recalls, E said, "draw a line below the last word you have written. There were fifteen words on the list. Count the number you have written. If you have not already written 15 words, I want you to write additional words, below the line you have drawn, until the total is 15. Write any additional words that occur to you, even though you are not sure they were on the original list I read or even though you are sure they were not on the list. Write words until the total number, that is those above the line together with those below the line, comes to 15." During this "forced recall", E said, from time to time, "Any words will do, any words you think of, just so the total is 15."

Data Analysis: Each free recall protocol was scored for correct responses and for intrusions. Minor variations in spelling were counted as correct. Each item given in a forced recall period for a list was scored correct or incorrect. If it was incorrect, it was determined how often it had been given in the group of Ss for that list. Further, free association norms made available by Deese (personal communication) were examined for the frequency of occurrence of any incorrect forced response as an associate to any list member. Forced responses which were additional associates to the list name were checked for associative frequency by means of the Russell-Jenkins (1954) norms.

*Deese also presented each list with an irrelevant "name". As he found no significant difference between the relevant and irrelevant name conditions, the irrelevant name condition was not replicated in this study.

Table 1

Mean Number of Correct Responses in Free and Forced Recall and of Intrusions in Free Recall

List*	Free Recall		Forced Recall	
	Correct	Intrusions	Correct	Associates
High Frequency (1)	11.07	0.71	0.5[illegible]	[illegible]
High Frequency (4)	9.76	1.35	0.[illegible]	[illegible]
High Frequency (7)	9.50	0.45	0.59	[illegible]
High Frequency (10)	9.46	0.74	0.57	[illegible]
High Frequency (13)	9.05	0.23	0.73	[illegible]
High Frequency (16)	10.05	0.45	1.00	[illegible]
Mean High Frequency	9.830	0.655	0.[illegible]35	[illegible]
Low Frequency (17)	8.82	2.00	0.[illegible]	[illegible]
Low Frequency (14)	7.76	1.[illegible]	0.18	[illegible]
Low Frequency (11)	7.78	1.17	0.43	[illegible]
Low Frequency (8)	9.87	0.65	0.39	[illegible]
Low Frequency (5)	8.[illegible]	1.50	0.50	[illegible]
Low Frequency (2)	9.32	0.73	0.27	[illegible]
Mean Low Frequency	8.[illegible]5	1.30[illegible]	0.3[illegible]	[illegible]
Zero Frequency (9)	8.06	0.94	0.0[illegible]	[illegible]
Zero Frequency (12)	7.55	1.00	0.18	[illegible]
Zero Frequency (15)	7.70	0.96	0.22	[illegible]
Zero Frequency (18)	7.00	1.05	0.1[illegible]	[illegible]
Zero Frequency (3)	9.[illegible]	0.59	0.2[illegible]	[illegible]
Zero Frequency (6)	9.00	0.82	0.0[illegible]5	[illegible]
Mean Zero Frequency	8.07[illegible]	0.[illegible]00	0.[illegible]1[illegible]	[illegible]

*The number in parentheses refers to the list number as shown in Deese's Tables 1 and 3

RESULTS

Period of Free Recall: The results for free recall paralled those reported by Deese. Table 1 gives the mean free recall scores for each list and for the three frequency categories, as well as the mean number of intrusions in free recall and the mean number of correct responses given in forced recall. The free recall scores are higher than those Deese reported, but the order of the mean values for the high, low, and zero-frequency lists is the same in the two experiments. The r between mean free recall score and inter-item associative strength by list was 0.77 (rho was 0.833). An r of =0.40 was obtained between mean number of intrusions and inter-item associative strength. These values are comparable to those found by Deese.

Period of Forced Recall: The r between inter-item associative strength and mean number of correct responses in forced recall was 0.93. However, the number of such responses, as Table 1 shows, was small, never exceeding a mean of one. This would suggest that the failure of Ss to match list length is probably not due to their inability to recognize correct responses if they occur.

The last column in Table 1 indicates for each list the percentage of responses produced in forced recall which were associates of either a list member or of the list name. On the average, for each list frequency, these percentages vary from 33 to 42. Thus, over-all, less than half of these forced responses appear to be associates. A tabulation was made of the number of times Ss produced the same response during forced recall. From two to eight Ss did give the same forced responses, but the total number of words on which such agreement occurred constituted only 11% of all the responses given during forced recall of the high-frequency lists, 16% for the low-frequency

[illegible] Butterfly List [illegible] forced recall [illegible] order to table.

… Number	[illegible]	[illegible]	Free Recall Frequency of List Member
[illegible]	[illegible]	[illegible]	18
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	9
[illegible]	[illegible]	[illegible]	17
[illegible]	[illegible]	[illegible]	20
[illegible]	[illegible]	[illegible]	27
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	18
[illegible]	[illegible]	[illegible]	7
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	20
[illegible]	[illegible]	[illegible]	12
[illegible]	[illegible]	[illegible]	21
[illegible]	[illegible]	[illegible]	6
[illegible]	[illegible]	[illegible]	15

lists, and 9% for the zero frequency lists. Clearly, the responses which occurred in forced recall were idiosyncratic, even when they were associates of the list member or the list name.

A further analysis of the erroneous forced-recall responses was made. In this analysis, the free associations to each list member which occurred in Deese's norms with a frequency of ten per cent or greater were listed. A tabulation was then made for each such response of its frequency of occurrence in the forced recalls. If the subjects were associating to the list members in their efforts to match list length during the forced recall period, one would expect that these words would occur in the forced recalls at about the same frequency levels they display in the free association situation.

Reference to Table 2 will clarify the procedure and indicate the nature of the results obtained. In the first column of Table 2 the list members of the low-frequency list named "Butterfly" are given in alphabetical order. In the second column for each list member are given the responses and their associative frequencies which occurred with a frequency of 10% or greater in Deese's free associative sample of 50 Ss. The number in parentheses following a word gives its associative frequency. The third column for each list member gives for each of its associates (Column 2) its frequency of occurrence in the forced recall of 27 Ss. If the associate is a list member, this fact is indicated by a dash rather than by a number. The final column gives the frequency of occurrence in free recall of the list member for the 27 Ss.

For example, the list member "beautiful" occurs 19 times in free recall; its high frequency associates are girl, woman, and lovely. None of these three associates occurs in forced recall. The list member "flutter" occurs 17 times in free recall, and its associates are fly, butterfly, and bird. Fly occurs in six of the forced recalls,

representing one-third of the times "butterfly" is recalled. Butterfly is the list-name, and bird does not occur in forced recall.

The data displayed in Table 2 are representative of those found in the other 17 tables constructed for the other 17 lists. The relations seen in Table 2 are harder to see in the lists composed of high-frequency associates, because so many of the associates of list members are also list members. Table 3, however, displays parallel data for the high-frequency "Butterfly" list. Table 4 gives parallel data for the zero-frequency "Butterfly" list.*

Returning to Table 2, we may describe some of its important features. Some of the high-frequency responses given in free association to the list members simply do not occur in forced recall. Examples are girl, tractor, run, stamp(s), gay to the first five list members listed. Others occur with a frequency in forced recall the same as, or greater than, that expected from the associative norms. Examples are fly, flower(s), tree(s), and fly (again) to the stimuli flutter, garden, nature, and wasp, respectively. Girl, tractor, run, stamp(s), and gay probably do not fit into the general context of the list, whereas fly, flower(s), and tree(s) perhaps do fit better with the context. Thus it is possible that some kind of contextual feature of the list determines the under- or over-utilization of associations to list members in forced recall. However, associative convergence, or its absence, might account for these results. Fly is an associative response to two list members as well as to butterfly;

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*It should be remembered that each list was presented in a single serial (unalphabetized) order to all Ss. Recalls for all lists showed marked, classical bow-shaped curves of serial position. Variations in the recall frequencies of list members may be due to this serial position factor.

flower(s) occurs to one list member as well as to butterfly. Tree(s), however, occurs to only one list member. In addition, there are cases of convergence in which forced recall frequency is low. Buy occurs to two list members and to butterfly, but it is infrequent in forced recall. Blue occurs with a frequency of 80% to sky, a list member, and also to butterfly; it occurs but once in forced recall. Bird also occurs both to butterfly and to a list member, but not in forced recall.

It appears that a contextual factor established by the list (or by the members of it S recalls) is responsible for the suppression of some and the facilitation of other associations to list members during forced recall. The nature of these suppressing and facilitating effects remains to be understood and the parameters of which they are a function remain to be specified. However, it would seem as though such contextual effects must modulate the influence of direct associative relationships in the process of free recall.

Several additional control experiments should be run before this conclusion can be regarded as established. It may be that more specific instructions to associate to list members or to the list name and instructions designed to reduce any set for accuracy would significantly alter the results obtained.* Further, the separation of forced recall from free recall may have introduced problems of set which have complicated the results. Suitable control experiments are presently being conducted.

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*Deese (personal communication) has reported that instructions that the list members were associates to the name and that S could increase his score by associating to the name did not alter the results of the original experiment.

SUMMARY

A replication of [illegible] an experiment by Deese was carried out to evaluate associative factors in free recall. Groups of Ss heard a single presentation of 15-item lists, some of which were composed of high-frequency associates of a list name, others of low-frequency associates of a list name, and still others of zero-frequency associates of a list name. In the period of free recall similar results to those obtained by Deese were [illegible]. Free recall was followed by a period of forced recall in which S added words to his list until his total recalled list length [illegible]. The number of correct responses made in forced recall was [illegible] with the inter-item associative strength of the lists. However, it was found that [illegible] high-frequency associates of the list names did not occur in free recall [illegible] occur with increased frequency. [illegible] suggests that a [illegible] is responsible for the suppression [illegible] associates to forced recall.

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